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ABSTRACT

In the 3 years since their introduction, Internet-capable cellular telephones are used by over 47 million Japanese (37% of the population) which nearly equals the number of people using personal computers to access the Internet. If this trend continues, the cellular telephone will overtake the personal computer as the most widely used Internet access device in Japan. However, this development has gone largely unnoticed by researchers. Such a trend deserves greater attention, both to understand the nature of Japanese use of communication technologies and to assess these technologies' potential for educational application. This paper examines the impediments that slowed Japan's early acceptance of the Internet, describes how these barriers were overcome by Internet-capable cellular telephones, considers the strengths and weaknesses of these emerging technologies, and assesses the potential for using portable wireless communication devices in educational settings. (Author)

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Japan's Widespread Use of Cellular Telephones to Access the Internet: Implications for Educational Telecommunications

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Abstract: In the three years since their introduction, Internet-capable cellular telephones are used by over 47 million Japanese (37% of the population) which nearly equals the number of people using personal computers to access the Internet. If this trend continues, the cellular telephone will overtake the personal computer as the most widely used Internet access device in Japan. However, this development has gone largely unnoticed by researchers. Such a trend deserves greater attention, both to understand the nature of Japanese use of communication technologies and to assess these technologies' potential for educational application. This paper examines the impediments that slowed Japan's early acceptance of the Internet, describes how these barriers were overcome by Internet-capable cellular telephones, considers the strengths and weaknesses of these emerging technologies, and assesses the potential for using portable wireless communication devices in educational settings.

Introduction

Despite nearly a decade of general economic stagnation, Japan's telecommunications industry has continued to grow by developing innovative and sophisticated wireless communication devices. These products, most notably Internet-capable cellular telephones, have been readily accepted by Japanese consumers and the increasingly widespread use of these devices has both changed popular culture and, more importantly, greatly expanded Internet use in Japan. Indeed, the number of Internet-capable cell phones in use has grown dramatically since they first appeared in 1999, and the cell phone may soon overtake the personal computer as Japan's Internet-access medium of choice.

Despite this trend, few, if any, scholars have formally asked what role Internet-capable cellular telephones may play in educational telecommunications. Certainly, the limitations of current cell phone technology make its near-term use in educational contexts doubtful. However, Japan's rapid and widespread adoption of cellular telephones as an Internet access medium make this an important area of study to determine if these technologies can be used in educational settings. Examining Japan's use of these technologies is appropriate as Japanese cellular technology is estimated to be several years ahead of America (Despeignes 2000). Thus, understanding the Japanese case could be a strong indicator of the kinds of communication tools and opportunities that may become available in America.

This paper begins with an description of the conditions that restrained Japan's early use of the Internet relative to other countries. The next section describes Japan's rapid acceptance of Internet-capable cellular telephones and shows how these devices overcame the barriers to Internet use. The following section assesses the strengths and weaknesses of current cell phone technologies and the concluding sections considers how these devices might be used in educational settings.

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Impediments to Internet Acceptance in Japan

Personal computer and Internet use in Japan have lagged behind the United States and other industrialized countries according to a Japanese Ministry of Public Management, Home Affairs, Posts and Telecommunications' report (MPHPT 1999). Scholarly research on the nature of Japanese computer and Internet use is limited, but Aoki's assessment of barriers to wider Internet access in Japan reflects the conventional thinking behind Japan's slow acceptance (Aoki 1995):

1. Businesspeople prefer face-to-face communications, and access to e-mail in the office is limited.
2. Phone rates are calculated by the minute which inhibits extended online time.
3. Computer use is considered as unfashionable and computer users are often characterized as nerds.
4. Typing is still a relatively uncommon skill among Japanese people, and involves using four types of written Japanese characters.

It should be noted that since Aoki's report was written, flat-rate ISDN Internet access (among others) has flourished in Japan bringing online costs down to more accessible levels. However, lingering negative images of computer users and the QWERTY keyboard interface continue to be strong disincentives to increased computer-based Internet access in Japan. For comparison, one estimate indicates that only 14% of Japanese people use computers to access the Internet versus 37% in the United States (Schmetzer 2000).

In contrast to the slow pace of computer-based Internet use, using cellular telephones (or keitai, pronounced "kay-tie") for Internet access has increased dramatically in Japan since its introduction in February, 1999, and is rapidly becoming a, if not the most, popular way to access the Internet. Computer access of the Internet has shown a large increase over the past couple of years, but cellular phone access rose at an even greater rate; MPHPT statistics show (MPHPT 2001) that between 1999 and 2000, households using personal computers to access the Internet almost doubled (19.1% to 34.0%), but the percentage of households using cellular phones to access the Internet tripled (8.9% to 26.7%).

Figure 1: Sample *keitai* mail message in English

Additional quantification can be seen by looking at the example of NTT DoCoMo, Japan's largest telecommunications company. Internet-capable cellular phones were introduced by the DoCoMo in Japan in February, 1999, under the brand name "i-mode." Starting in mid-2000, all DoCoMo cell phones were

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"compatible with Internet standards such as HTML, http, gif, and Java," so users can surf the Web in addition to checking their mail (Legace 2001). In less than three years, nearly 29 million people subscribe to DoCoMo's Internet cell phone service at the end of 2001 (TCA 2001). The total number of Internet-capable cell phones in Japan is just over 47 million out of an installed base of over 66 million cell phone service subscribers according to the Japanese Telecommunications Carriers Association's monthly data (TCA 2001). Based on these numbers, nearly 40% of all Japanese people carry Internet-capable *keitai*.

Keitai Use Increases Japanese Internet Access

Clearly *keitai*, especially those with Internet capability, have been rapidly and widely accepted by the Japanese consumer. This high rate of acceptance indicates that *keitai* have successfully overcome the barriers to Internet access–which personal computers failed to do–despite having been on the market for only three years.

Internet access from the office: The first barrier to wider Internet access posed by Aoki was in the business realm where face-to-face meetings and limited in-office e-mail access limited greater use. Certainly, face-to-face communications will edge out most technology-mediated communications in certain business situations. However, business people can use their own *keitai* to be able to access the Internet despite restrictions on using company computers for personal e-mail or WWW use (see, for example, Schmetzer 2000).

Low cost: As noted above, computer online time has become less expensive since Aoki released her paper. However, since that time, increased competition between *keitai* service providers has made monthly calling packages more affordable and inexpensive e-mail messages are among the most popular services. Indeed, my students emphatically state (see the next section for additional details of these empirical data) that low cost is the primary motivation for using written communications rather than making a voice call.[1] Perhaps more importantly, the initial cost of buying the necessary hardware (in some cases the phone is free), makes a *keitai* an attractive choice over even the most affordable computer.

Socially acceptable: While it is rare to see a commuter on a train in Tokyo using a laptop computer (besides himself, the author has seen only one other person using a computer on the train in the last 12 months), it is rare *not* to see several commuters engrossed in reading and writing *keitai* mail. Indeed, *keitai* mail users are so common at coffee shops, on public transportation, and in parks that they would only be conspicuous in their absence. *Keitai* use has become an acceptable means of communicating with others in public without the negative images still assigned to computer mail users. Indeed, we may have already entered a situation in Japan where *not* carrying a cell phone is seen as socially unacceptable. A straw poll of 104 of my students in an large, private, Japanese university indicates that *all 104 of them have a cell phone*, and that 68 of the 104 used their cell phone to access the Internet before using a personal computer. Another indication of how indispensable these devices have become, over half (18) the students in a class of 32 do not wear a watch but rather use their cell phone clock to tell time.

Unique Input Method: The most common input method is using one or both thumbs on the phone's keypad (see Fig. 2). Typing is possible (using an attachable keyboard) but few people use them in public. While the author, a novice at *keitai* mail, taps out only a few words per minute, experienced users can achieve remarkable speeds using only their thumb to input text and select graphic emoticons (French, 2000). French also notes that one heavy *keitai* user can reportedly type out messages solely by touch; this is not as rare a skill as it might sound. Several of my students claim to be able to type *keitai* mail without looking at the keypad.

Taken together, these points indicate that the barriers to Internet use cited by Aoki concerning Internet access seem to have been largely, if not completely, overcome by the Internet-capable cellular telephone. However, while its ability to enhance Japanese Internet use may be established, the *keitai* faces greater challenges if it is to become a widely used Internet appliance for educational telecommunications.

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[1] Each *keitai* e-mail message costs about 2.5 cents to send and is free to receive compared with voice messages which run about 45 cents per minute to send but are also free to receive. This difference can add up when one realizes that it is not uncommon for young people to send 10 or more messages per day.

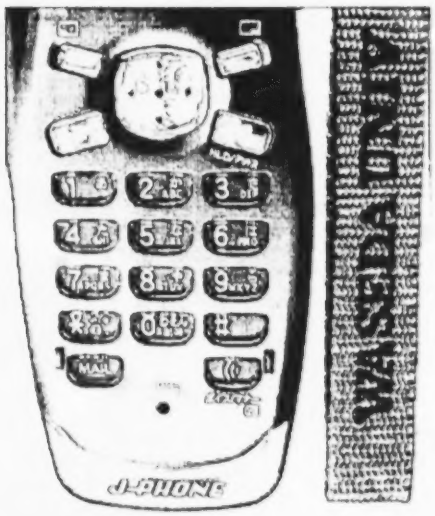

Figure 2: Input Keypad Showing Japanese and English Characters

Limitations and Challenges

Despite the many advantages to the *keitai*, several obvious limitations will need to be overcome to enhance this device's potential as a general-use Internet application. Initially, the small screen, especially when typing in English, is a clear limiting factor. Generally, the screen can only display 64 characters at one time (see Fig. 1), although total message length depends on the options allowed by the telephone and the service provider. For instance, the author's phone (shown in all the images in this paper) is capable of creating messages up to 128 characters, or "long mail" messages of up to 5910 characters. However, even with a good resolution color screen, reading (let alone keying in!) a 5000+ character message would strain the recipient's eyes to the point of exhaustion. Using a *keitai* for educational purposes would require tasks that can be easily completed within a few hundred characters or modifying the *keitai's* output ability to enable the user to read or hear longer messages.

As indicated above, inputting a lengthy *keitai* mail message is impractical for the average user. External keyboards are available–ranging from roughly the size of a credit card to approximately the size of a postcard–but the author has never seen one being used in public. It is unclear if the difficulty of inputting text can be overcome with practice, but empirical reports from Japanese college students indicates that their typing speed increased the longer they used their *keitai*. However, after several weeks of inputting English-language messages using my *keitai's* keypad, my typing speed is still painfully slow and I prefer leaving voice messages despite the increased cost. Emoticons and preset phrases are one answer (see, for example, French 2000). However, I would welcome a personal digital assistant-like character recognition system using an input stylus. This is still slower than typing on a keyboard, but retains much of the *keitai's* portability.

The Potential for *keitai* in Educational Settings

The Japanese case shows that a large number of people are using their cellular phone to exchange e-mail and receive information from the World Wide Web. Such widespread use should not be ignored as such devices may have a place in educational telecommunications. Despite its potential, it seems clear that *keitai* technology will require additional development if it is to receive widespread use in educational settings.

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Attitudinal Challenges: Many American schools had bans on bringing and using cellular telephones. After the terrorist attack on September 11, 2001, however, some schools are rethinking this prohibition ("Schools Rethink" 2001). While greater access to cell phone use in schools may have started with a national tragedy, additional access will increase only if the potential to provide meaningful educational opportunities can be shown.

Despite gains in many areas, actual computer and Internet use in Japanese and American classrooms is still in its early stages. Access issues in both countries have largely been addressed and more attention is being paid to inservice education and curriculum development. However, computer use in schools is still far from established and commonplace and there is a strong sense that educators in both countries are still in the experimental stage. The prospect of purchasing new hardware, educating teachers, and devising curricula to incorporate a new type of technology may get a cold reception at many schools. It seems reasonable that any new communications technology would have to prove its utility up front, and may need to start with a supplementary role alongside existing equipment and projects, enhancing rather than replacing what is already in place. One can imagine, for instance, a cell phone-like device being used by one group in the field to communicate sounds, text, and images back to their home station computer where these data are stored and manipulated.

Hardware Challenges: The expense of personal computers has usually been borne by schools and made available to students in the form of a classroom computer(s) or a computer lab. Cellular telephones are usually personal communication devices, purchased and maintained by an individual, and are rarely shared. Certainly allowing students to use their own telephones as part of a school exercise has some appeal, as the cost of the phone and connection service is borne by the student. But unlike my economically comfortable university students all of whom carry cell phones, many college and high school students in Japan and America are unable to afford this service. If schools are to provide wireless communications devices to students, they must be able to exert some control over how these devices are used. It may be that this need can be filled by a portable wireless communication device similar to a personal digital assistant-cell phone hybrid that enables the exchange of text, sound, and graphics with a restricted number of other units. In any event, current cell phone technology shows some promise, but may require modification and development before it can be comfortably used in K-12 classrooms.

Conclusion

The greatest benefit of Internet-capable cell phones in Japan has been their ability to bring large numbers of Japanese people onto the Internet in a way that has been useful and entertaining for them. The learning curve is negligible compared to personal computer-based access, and the cost of setting up and using this service continues to attract large numbers of new users. Cellular phones have largely overcome Internet-access barriers where personal computers failed, and future developments should be monitored to see if these devices can be adapted to educational use.

Despite the limitations cited above, the continued development of cellular phone technology, and the potential to blend it with personal digital assistants or other palm-top devices, may allow fourth- or fifth-generation wireless devices to be incorporated as one part of a larger information and telecommunications strategy for use in schools. As schools, in Japan and elsewhere, become more accustomed to using technological tools in the classroom, and the cost of hardware continues to decline, we may see a division of labor where cellular telephones are primarily used for transmitting voice, text, and images while the personal computer is used primarily for more extensive communications and production work.

When NTT launched its i-mode service three short years ago, few observers could have guessed that millions of users would be exchanging text messages on their cell phones, performing online banking services, or reading restaurant reviews on the Web. There is a sense that attempts to speculate where these technologies will be in three more years will fall woefully short. However, I firmly believe that this trend deserves our attention, and we should follow the progress of portable wireless communication devices like *keitai* with an eye to incorporating them into our arsenal or educational telecommunications technologies.

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